WHAT IS CLAIMED IS:

1. A light-emitting device, comprising:

a multi-layer stack of materials including a light-generating region and a first layer supported by the light-generating region,

wherein:

a surface of the first layer is configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the first layer;

the surface of the first layer has a dielectric function that varies spatially according to a pattern; and

the pattern has an ideal lattice constant and a detuning parameter with a value greater than zero.

2. The light-emitting device of claim 1, wherein the multi-layer stack of materials comprises a multi-layer stack of semiconductor materials.

3. The light-emitting device of claim 2, wherein the first layer comprises a layer of n-doped semiconductor material, and the multi-layer stack further comprises a layer of p-doped semiconductor material.

4. The light-emitting device of claim 3, wherein the light-generating region is between the layer of n-doped semiconductor material and the layer of p-doped semiconductor material.

5. The light-emitting device of claim 4, further comprising a support that supports the multi-layer stack of materials.

6. The light-emitting device of claim 5, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material, the layer of reflective material being between the support and the multi-layer stack of materials.

7. The light-emitting device of claim 6, wherein a distance between the layer of p-doped semiconductor material and the layer of reflective material is less than a distance between the layer of n-doped semiconductor material and the layer of reflective material.

8. The light-emitting device of claim 7, further comprising a p-ohmic contact layer between the layer of p-doped material and the layer of reflective material.

9. The light-emitting device of claim 1, further including a current-spreading layer between the first layer and the light-generating region.

10. The light-emitting device of claim 1, wherein the multi-layer stack of materials comprise semiconductor materials.

11. The light-emitting device of claim 10, wherein the semiconductor materials are selected from the group consisting of III-V semiconductor materials, organic semiconductor materials and silicon.

12. The light-emitting device of claim 1, wherein the pattern does not extend into the light-generating region.

13. The light-emitting device of claim 1, wherein the pattern does not extend beyond the first layer.

14. The light-emitting device of claim 1, wherein the pattern extends beyond the first layer.

15. The light-emitting device of claim 1, further comprising electrical contacts configured to inject current into the light-emitting device.

16. The light-emitting device of claim 15, wherein the electrical contacts are configured to vertically inject electrical current into the light-emitting device.

17. The light-emitting device of claim 1, wherein the pattern is partially formed of a component selected from the group consisting of holes in the surface of the first layer, pillars in the first layer, continuous veins in the first layer, discontinuous veins in the first layer and combinations thereof.

18. The light-emitting device of claim 1, wherein the pattern is selected from the group consisting of triangular patterns, square patterns, and grating patterns.

19. The light-emitting device of claim 1, wherein the pattern is partially formed of holes in the surface of the first layer.

20. The light-emitting device of claim 1, wherein the detuning parameter is at most about 25% of the ideal lattice constant.

21. The light-emitting device of claim 1, wherein the detuning parameter is at least about 1% of the ideal lattice constant.

22. The light-emitting device of claim 1, wherein the pattern corresponds to a substantially randomly detuned ideal pattern.

23. The light-emitting device of claim 1, wherein the pattern is configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region.

24. The light-emitting device of claim 1, wherein the light-emitting device is selected from the group consisting of light-emitting diodes, lasers, optical amplifiers, and combinations thereof.

25. The light-emitting device of claim 1, wherein the light-emitting device comprises a light emitting diode.

26. The light-emitting device of claim 1, wherein the light-emitting device is selected from the group consisting of OLEDs, flat surface-emitting LEDs, HBLEDs, and combinations thereof.

27. A light-emitting device, comprising:

a multi-layer stack of materials including a light-generating region and a first layer supported by the light-generating region,

wherein:

a surface of the first layer is configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the first layer; and

the surface has a dielectric function that varies spatially according to a nonperiodic pattern.

28. The light-emitting device of claim 27, wherein the nonperiodic pattern is selected from the group consisting of aperiodic patterns, quasicrystalline patterns, Robinson patterns, and Amman patterns.

29. The light-emitting device of claim 27, wherein the multi-layer stack of materials comprises a multi-layer stack of semiconductor materials.

30. The light-emitting device of claim 29, wherein the first layer comprises a layer of n-doped semiconductor material, and the multi-layer stack further comprises a layer of p-doped semiconductor material.

31. The light-emitting device of claim 30, wherein the light-generating region is between the layer of n-doped semiconductor material and the layer of p-doped semiconductor material.

32. The light-emitting device of claim 31, further comprising a support that supports the multi-layer stack of materials.

33. The light-emitting device of claim 32, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material, the layer of reflective material being between the support and the multi-layer stack of materials.

34. The light-emitting device of claim 33, wherein a distance between the layer of p-doped semiconductor material and the layer of reflective material is less than a distance between the layer of n-doped semiconductor material and the layer of reflective material.

35. The light-emitting device of claim 34, further comprising a p-ohmic contact layer between the layer of p-doped material and the layer of reflective material.

36. The light-emitting device of claim 27, further including a current-spreading layer between the first layer and the light-generating region.

37. The light-emitting device of claim 27, wherein the multi-layer stack of materials comprise semiconductor materials.

38. The light-emitting device of claim 37, wherein the semiconductor materials are selected from the group consisting of III-V semiconductor materials, organic semiconductor materials and silicon.

39. The light-emitting device of claim 27, wherein the pattern does not extend into the light-generating region.

40. The light-emitting device of claim 27, wherein the pattern does not extend beyond the first layer.

41. The light-emitting device of claim 27, wherein the pattern extends beyond the first layer.

42. The light-emitting device of claim 27, further comprising electrical contacts configured to inject current into the light-emitting device.

43. The light-emitting device of claim 42, wherein the electrical contacts are configured to vertically inject electrical current into the light-emitting device.

44. The light-emitting device of claim 27, wherein the pattern is partially formed of a component selected from the group consisting of holes in the surface of the first layer, pillars in the first layer, continuous veins in the first layer, discontinuous veins in the first layer and combinations thereof.

45. The light-emitting device of claim 27, wherein the pattern comprises a Penrose pattern.

46. The light-emitting device of claim 27, wherein the pattern is partially formed of holes in the first layer.

47. The light-emitting device of claim 27, wherein the pattern is configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region.

48. The light-emitting device of claim 27, wherein the light-emitting device is selected from the group consisting of light-emitting diodes, lasers, optical amplifiers, and combinations thereof.

49. The light-emitting device of claim 27, wherein the light-emitting device comprises a light emitting diode.

50. The light-emitting device of claim 27, wherein the light-emitting device is selected from the group consisting of OLEDs, flat surface-emitting LEDs, HBLEDs, and combinations thereof.

51. A light-emitting device, comprising:

a multi-layer stack of materials including a light-generating region and a first layer supported by the light-generating region,

wherein:

a surface of the first layer is configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the first layer; and

the surface has a dielectric function that varies spatially according to a complex periodic pattern.

52. The light-emitting device of claim 51, wherein the pattern is selected from the group consisting of honeycomb patterns and Archimidean patterns.

53. The light-emitting device of claim 51, wherein the multi-layer stack of materials comprises a multi-layer stack of semiconductor materials.

54. The light-emitting device of claim 53, wherein the first layer comprises a layer of n-doped semiconductor material, and the multi-layer stack further comprises a layer of p-doped semiconductor material.

55. The light-emitting device of claim 54, wherein the light-generating region is between the layer of n-doped semiconductor material and the layer of p-doped semiconductor material.

56. The light-emitting device of claim 55, further comprising a support that supports the multi-layer stack of materials.

57. The light-emitting device of claim 56, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material, the layer of reflective material being between the support and the multi-layer stack of materials.

58. The light-emitting device of claim 57, wherein a distance between the layer of p-doped semiconductor material and the layer of reflective material is less than a distance between the layer of n-doped semiconductor material and the layer of reflective material.

59. The light-emitting device of claim 58, further comprising a p-ohmic contact layer between the layer of p-doped material and the layer of reflective material.

60. The light-emitting device of claim 51, further including a current-spreading layer between the first layer and the light-generating region.

61. The light-emitting device of claim 51, wherein the multi-layer stack of materials comprise semiconductor materials.

62. The light-emitting device of claim 61, wherein the semiconductor materials are selected from the group consisting of III-V semiconductor materials, organic semiconductor materials and silicon.

63. The light-emitting device of claim 51, wherein the pattern does not extend into the light-generating region.

64. The light-emitting device of claim 51, wherein the pattern does not extend beyond the first layer.

65. The light-emitting device of claim 51, wherein the pattern extends beyond the first layer.

66. The light-emitting device of claim 51, further comprising electrical contacts configured to inject current into the light-emitting device.

67. The light-emitting device of claim 66, wherein the electrical contacts are configured to vertically inject electrical current into the light-emitting device.

68. The light-emitting device of claim 51, wherein the pattern is partially formed of a component selected from the group consisting of holes in the surface of the first layer, pillars in the first layer, continuous veins in the first layer, discontinuous veins in the first layer and combinations thereof.

69. The light-emitting device of claim 51, wherein the pattern comprises a honeycomb pattern formed of holes, at least some of the holes having different diameters.

70. The light-emitting device of claim 51, wherein the pattern is partially formed of holes in the first layer.

71. The light-emitting device of claim 51, wherein the pattern is configured so that light emitted by the surface of the first layer has a spectrum of radiation modes, and the spectrum of radiation modes is substantially the same as a characteristic emission spectrum of the light-generating region.

72. The light-emitting device of claim 51, wherein the light-emitting device is selected from the group consisting of light-emitting diodes, lasers, optical amplifiers, and combinations thereof.

73. The light-emitting device of claim 51, wherein the light-emitting device comprises a light emitting diode.

74. The light-emitting device of claim 51, wherein the light-emitting device is selected from the group consisting of OLEDs, flat surface-emitting LEDs, HBLEDs, and combinations thereof.